Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
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Re:	Letter ballot #13 on document **IEEE P802.16-REVd/D1-2003**
Abstract	Letter ballot comment on revisions related to 8.3.1.4 too large and detailed for inclusion within Commentary.
Purpose	To provide text and editing instructions for the comment referenced by author's Commentary submission.
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Addendum to Comment in Letter Ballot #13

Brian Eidson
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Amendments related to WirelessMAN SC-a Burst Framing

The following text and editing instructions attempt to improve section 8.3.1.4 on WirelessMAN-SCa Burst Framing. Effort was made to improve its organization by denominating the standard burst type as such, pulling the section on STC into the framing section as another burst framing type, and then rewording both parts and necessary so that they fit together well. Another optional framing type with scope limited to the UL and intended for concurrent transmissions was also introduced and integrated into section 8.3.1.4. Hooks for its support were incorporated elsewhere in the document as needed.

On page 381, beginning line 8 and continuing through line 40, make the following changes:

8.3.1.4 Burst framing

Both downlink and uplink data shall be formatted into ~~bursts that use the~~ framed bursts ~~format~~. The downlink shall support one or more ~~the most general case of~~ framed TDM bursts, while the uplink shall support framed TDMA bursts. ~~TDMA burst and continuous downlink operational modes are subclasses of the TDM burst downlink mode of operation, and should be realizable using equipment designed for general TDM operation.~~ The coordination of framed uplink and downlink bursts used to implement a TDD or FDD system is specified in 8.3.1.5.

The frame format used by a burst is indicated by the Burst Frame Type burst profile encoding. Three frame formats are defined. The Standard frame format (8.3.1.4.1) shall be supported on both the uplink and downlink. This frame format is always used for data containing broadcast information. The STC Frame format (8.3.1.4.3) is optional and shall be used only for STC encoded data on the uplink or downlink. The Subchannel frame format (8.3.1.4.4) is optional and shall be used only on the uplink.

Although bursts in the Standard, STC, and Subchannel frame format may coexist on the same channel, they shall not overlap in time.

8.3.1.4.1 ~~Fundamental burst framing elements~~ Standard frame format

Figure 187 depicts a burst with the standard frame format. As ~~Figure 187~~ illustrated, the burst consists of three fundamental framing elements: a Burst Preamble that includes ramp up; a Payload; and a Receiver Delay Spread Clearing Interval (RxDS) interval that includes ramp-down.

On page 381, line 40, change the caption for Figure 187 to be:

Figure 187—Fundamental ~~burst~~ framing elements in a standard format burst

Move section 8.3.3.1 (beginning page 407, line 1) and all subsections to page 385, and introduce a new section which directly precedes 8.3.1.5. Make the section number of this section 8.3.1.4.3. Rename the title of this section as follows:

8.3.1.4.3 STC transmit diversity and frame format

Eliminate section heading 8.3.3 and the paragraph below it (which precedes the just moved 8.3.3.1), and change any reference (if any) in the document for 8.3.3 to the newly created section 8.3.4.3

On page 385, following the last sentence on the page, introduce a new section which precedes 8.3.1.5. This new section will be 8.3.1.4.4. Use the following section heading and the text that follows for this new section:

8.3.1.4.4 Subchannel frame format

The subchannel frame format is used to frame bursts that are transmitted on subchannels.

8.3.1.4.4.1 Framing Procedure

A payload shall be formatted into a subchannel frame formatted burst using the following procedure:

1. Form a Base frame by attaching a preamble to the payload as shown in Figure 190. The preamble shall be constructed from *m* repeated Unique Words , as specified in the burst profile for Preamble parameters, but without the additional ramp up symbols. The Unique Word length, *U*, is a burst profile parameter.
2. Partition the Base frame into Blocks of length *b* as shown in Figure 191, padding the frame with MAC dummy data as necessary to fill the last block. The value to be used for *b* is indicated in 8.3.1.4.4.3.
3. Suffix each block with a Known Word composed of *k* Unique Words to form Appended Blocks, as shown in Figure 192. *k* is a burst profile parameter.
4. Form Repeat Segments as shown in Figure 193 by concatenating N_r copies of each Augmented Block. The value to be used for N_r is indicated in 8.3.1.4.4.2.
5. Form Frame Segments as shown in Figure 194, by prefixing each Repeat Segment with a Cyclic Prefix (CP) of length *dU* symbols and a Known Word. Each Cyclic Prefix of a Repeat Segment is composed of the last *dU* symbols in that Repeat Segment. *d* is a burst profile parameter.
6. Concatenate Frame Segments to form a Subchannel Frame, as illustrated in Figure 195. Transmitter ramp up processing is applied to the first data in the burst; transmitter ramp down processing occurs directly following the last data in burst.
7. Apply the ramp up procedure of 8.3.1.4.1.1 to the first R_r symbols in the subchannel frame, where R_r is specified in the Preamble length burst profile encoding. Note, however, that in the context of subchannel framing, the preamble length is mU rather than $mU + R_r$.
8. Ramp down by inserting zero inputs into the transmit filter memory following the last data symbol in the subchannel frame, and allowing the natural response of the filter to drive the filter output to zero. The ramped down data is not considered part of the subchannel frame from which it was derived.

The resulting subchannel formatted frame is transmitted using the procedure described in 8.3.1.4.4.2.

Figure 190—Base frame

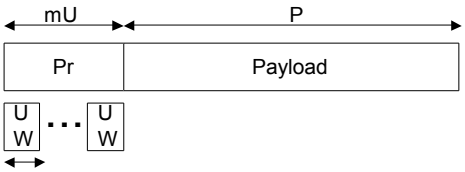


Figure 191—Baseline frame partitioning and padding

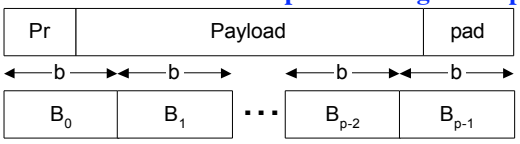


Figure 192—Known Word-suffixed blocks

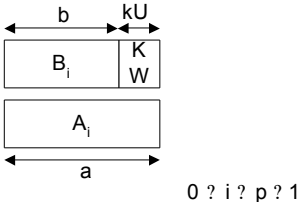


Figure 193—Generating Repeat Segments

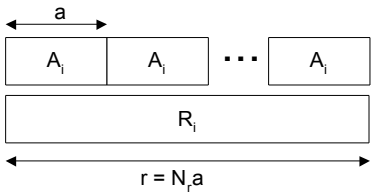


Figure 194—Generating a Frame Segment from a Repeat Segment

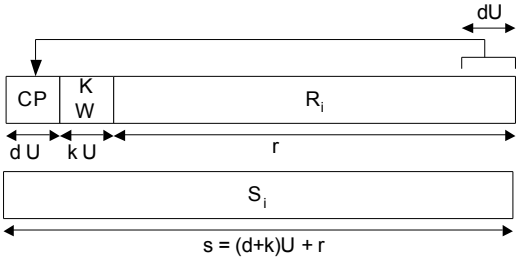
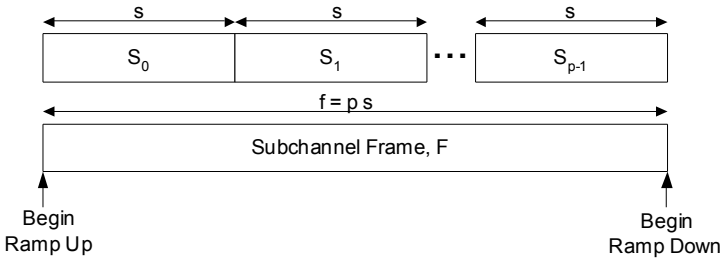


Figure 195—Formation of subchannel frame from frame segments



8.3.1.4.4.2 Subchannel burst frame transmission

When a subchannel burst frame is allocated, the UL MAP will indicate the start time and duration, as well as the starting subchannel index and number of consecutive subchannels assigned to a subchannel frame formatted burst. Subchannel assignments shall be selected from a set of $N_s = 8$ subchannels, with indices $\{0,1,\ldots,N_S - 1\}$.

Assignments to different subchannels may overlap in time and differ in duration. The SSTG between subchannel frames on the same subchannel shall be of length zero, overriding any UCD channel encoding for SSTG. In addition, although the assignments for a standard frame and a subchannel frame shall not overlap, the SSTG between a subchannel frame followed by a standard frame shall also have a length of zero. However, the SSTG between a standard frame followed by a SSTG shall comply with the UCD SSTG channel encoding.

When assigned a starting subchannel index of *h*, a transmitter shall multiply the symbols {I[n], Q[n]} composing a subchannel formatted frame by the complex exponential sequence

$$c[n] = \exp\left(\frac{j2\pi hn}{r}\right) \qquad \text{[Eq. XX1]}$$

to form output symbols

$$I^{out}[n] + jQ^{out}[n] = (I[n] + jQ[n])c[n] \qquad \text{[Eq. XX2]}$$

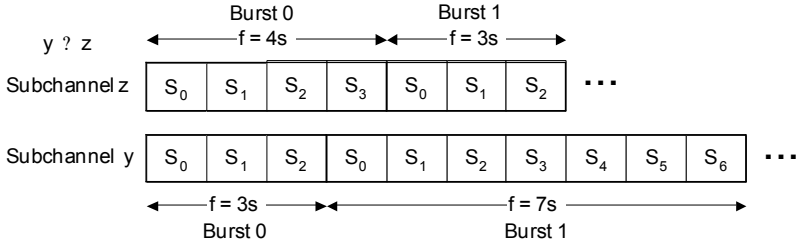
where [n] is the discrete time index of a symbol-spaced sampler and *r* is a burst profile encoding. Output symbols shall afterwards be fed to the pulse-shaping transmit filter.

Channel allocations shall always be consecutive, and allocated as a power of 2. When a subscriber is allocated $N_{alloc} = 2^g$ consecutive subchannels, $g \in \{0,1,\ldots, \log_2(N_s)\}$, a transmitter shall apply a repeat factor of

$$N_r = \frac{N_S}{2^g} \text{ .[Eq XX3]}$$

When transmissions on different subchannels overlap in time, their burst profile encodings for *U*, *k*, *d*, and *r* must all be common. Moreover, as illustrated in Figure 196, burst frame start times must be allocated such that constituent frame segments are time-aligned, although the start time and frame duration of independent bursts may be different.

Figure 196—Frame segment alignment for overlapping bursts on different subchannels



8.3.1.4.4.3 Burst profile parameters and derivations

Burst profile parameters associated specifically with subchannel framing are

k---the number of Unique Words (of length U) composing a Known Word
d---the length of a Cyclic Word in integer multiples of U
r---the Repeat segment length in symbols.

UCD encodings for these parameters are found in Table 281, under the name Subchannel frame parameters. Note that the combination of {d = 0, k=0} is not allowed.

Parameters used in the framing procedure of 8.3.1.4.4.1 are derived as follows:

$$a = \frac{r}{N_r} = \frac{rN_{alloc}}{N_s} \text{ [Eq. XX4]}$$

$$b = a \square kU \quad \text{[Eq. XX5]}$$

$$s = r + (k + d)U \quad \text{[Eq. XX6]}$$

A payload of length P symbols, with Preamble mU would be formatted into a subchannel frame composed of

$$p = \frac{(P+mU)N_s}{rN_{alloc} \square kU} \quad \text{[Eq. XX7]}$$

frame segments, each of length s, for a total length of

$$L_{frame} = p\left(r + (k + d)U\right) \text{ [Eq XX8]}$$

symbols.

On page 399, line 38, Table 181—SCa UL-Map IE, insert new rows and revise as shown:

Syntax	Size	Notes
UL-MAP_IE		
CID	16 bits	
UIUC	4 bits	

If (UIUC == 15) {		
Extended UIUC dependent IE	variable	
} else {		
Offset	12 bits	
~~if (Modulation Type is Spread BPSK) {~~		
~~**Duration**~~	~~12 bits~~	
~~}~~		
if ((Burst Frame Type is Subchannel) or (Modulation Type is Spread BPSK)) {		
Duration	12 bits	
if (Burst Frame Type is Subchannel) {		
Starting subchannel	4 bits	
Subchannel count	4 bits	
}		
}		
}		
}		

On page 400, line 18, replace definition for Duration with the following:

Duration:
For bursts associated with one of the spread BPSK modulation types or the subchannel burst frame type, this parameter specifies the length of the associated burst in minislots. (For bursts not assigned one of these types in which overlapped transmissions can occur, the duration of the burst is determined by the Offset appearing in the following IE entry and the offset of the current IE entry.)

Starting subchannel:
For bursts associated with the subchannel burst frame type, this parameter specifies starting subchannel assigned to the transmission.

Subchannel count:
For bursts associated with the subchannel burst frame type, this parameter specifies the number of adjacent subchannels assigned to the transmission.

On page 567, line 46, Table 281---UCD Burst Profile Encodings---WirelessMAN-SCa, replace definition add the following table entry following the last entry in the table:

Name	Type (1 byte)	Length	Value (variable length)
Subchannel frame parameters	26	1	4 MSBs: {k,d} specification 0 = {0,1}, 1 = {0,2} 2 = {1,0}, 3 = {1,1}, 4 = {1,2}, 5 = {2,2}, 6-15= reserved 4 LSBs: Repeat segment length, r, in symbols 0:7 = 2^(<value>+8) , 7-15= reserved.

On page 389, line37, section 8.3.1.5.1.3, add the following entry to the bottom of the list of 'additional TLV encodings':

Subchannel frame parameters

On page 391, line 49, section 8.3.1.5.2.1, add the following entry to the bottom of the list of 'additional TLV encodings:

Subchannel frame parameters

On page 664, line 41, section 12.2.3.1.1, add the following entry to the bottom of the second list:

==Subchannel framing where
Preamble composed of 2 UWs,

Subchannel framing parameters {k,d} = {1,1}
r = 1024 for 16 symbol UWs and r = 4096 for 64-symbol UWs

On page 665, line 43, section 12.2.3.1.3.2, add the following entry to the bottom of the list:

Subchannel frame parameters (if burst frame type is not a subchannel frame)

On page 598, line 60, below section 11.4.2.2.6.10, add another section:

11.4.2.2.6.11 Subchannel framing support

This field indicates the length of a Repeat Segment in a subchannel frame supported by an SS for uplink transmission. A bit value of 0 indicates "not supported" while 1 indicates "supported."

Type	Length	Value	Scope
?? (should be 5.12.27, but that is taken by the item in the next section--may need to re-number sections)	1	Bit 0: Repeat Segment r = 256 Bit 1: r= 512 Bit 2: r = 1024 Bit 3: r = 2048 Bit 4: r = 4096 Bit 5: r = 8096 Bits 6-7: *Reserved*; shall be set to 0.	SBC-REQ (see 6.4.2.3.23) SBC-RSP (see 6.4.2.3.24)